Amphipoda from the East Coast of India—2

Gammaridea and Caprellidea

BY

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(*With six text-figures*)

[*Continued from Vol.* **66** (3) : 576]

Cymadusa sardenta (Oliveira)

(Fig. 13)

Grubia sardenta Oliveira, 1953, p. 365, pls. 25-26.

Material : Hare Island, Tuticorin : 1 male from algae growing on a wooden pole.

Length : 10 mm.

Description : Male : Head less than twice as long as 1st segment. Eyes small, oval, colourless in alcohol (was probably red). Lateral lobes only slightly produced. Body broadly curved, with grey or violet patches and dots all over the body and appendages.

Antenna 1 as long as body, with short setae. Peduncle reaching end of 4th peduncular joint of antenna 2. 1st joint as long as 2nd and thrice that of 3rd, lower margin with a spine at 1/3 its length and another subterminal. Flagellum nearly 4 times as long as peduncle, with 53 joints. Accessory flagellum 2-jointed, 2nd being minute. Antenna 2 less than 2/3 as long as antenna 1. Peduncle as long as flagellum with long, dense, plumose setae on both the margins ; 4th joint a little longer than the 5th. Flagellum with short setae, with 33 joints.

Mandible : Molar well-developed, reniform. Primary cutting plate with 6 teeth and the accessory with 5. Spine row with 8 spines. 3rd joint of palp a little longer than 2nd, thrice as long as 1st, inner margin apically with about 10 long setae. Maxilla 1 : Inner plate very short, with 6 long setae on inner margin. Outer plate with 9 apical spines.

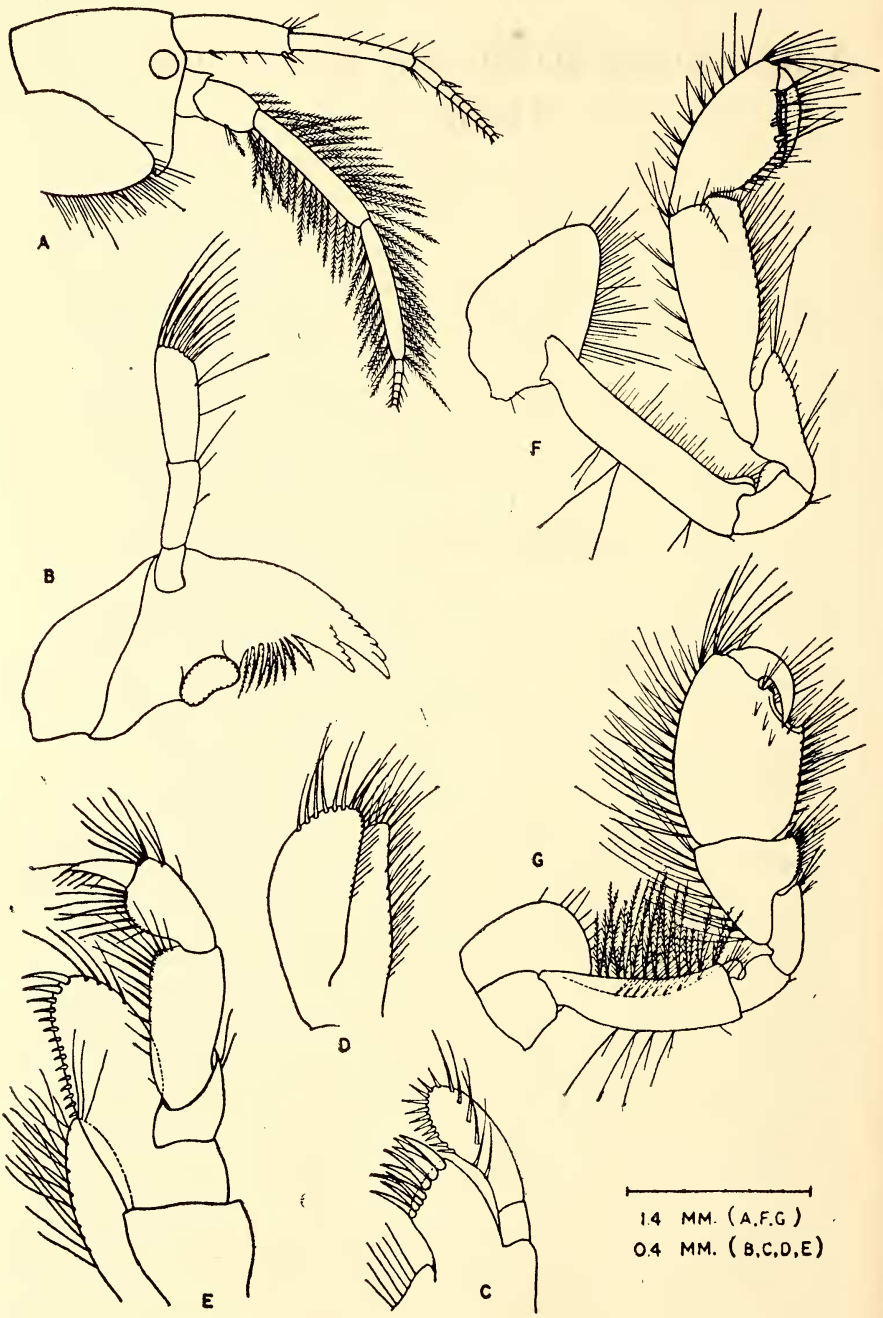

Fig. 13. *Cymadusa sardenta* (Oliveira). *Male* : A, head ; B, mandible ; C, maxilla 1; , D, maxilla 2 ; E, maxilliped ; F, gnathopod 1 ; G, gnathopod 2.

2nd joint of palp thrice as long as 1st, with 11 spines on apical and inner margins and an oblique row of 6 long setae on lower aspect. Maxilla 2 : Inner plate about half as broad as outer, both with long plumose setae apically and on inner margin. Maxilliped : Inner plate extending beyond base of 1st palpar joint inner margin and apex setose. Outer plate not reaching end of 2nd palpar joint, with 4 long setae at the apex and 16 spines on inner margin decreasing in length from the apex. 2nd palpar joint twice as long as 1st, inner margin with long setae ; 3rd joint narrower distally with long setae on both margins ; terminal joint with 6 stout setae on inner margin.

Gnathopod 1 much longer than gnathopod 2 but slender. Side plate oval, conically produced in front, with a fine row of setae below. 2nd joint narrow, as long as 5th joint, front margin with 2 angular ribs which are distally produced into two small, rounded lobes. 3rd joint half as long as next, front margin elevated into a rounded lobe. 4th joint hind margin distally produced into a conical, pointed lobe. 5th joint unusually long, constricted at the base and widening distally ; hind margin serrate, with dense setae, front margin with 8 sets of setae. 6th joint about 2/3 as long as 5th, densely setose, constricted at the base and widening distally. Palm shorter than hind margin, oblique, slightly concave, defined by a spine at posterior angle. Dactylus narrow, nearly straight, longer than the palm. Gnathopod 2 : Stout, densely setose with plumose setae. Side plate quadrate, rounded below. 2nd joint densely setose, longer than the 6th, front margin 2-ribbed and distally produced slightly. 3rd joint 2/3 as long as next, front margin with a notch near the base. 4th joint only slightly produced distally. 5th joint about half as long as 6th, both margins densely setose. 6th joint large, oval, densely setose. Palm oblique, shorter than hind margin, with a flat-topped tooth near the hinge of dactylus, followed by a concave portion and a pointed tooth defining the palm. Dactylus stout, strongly curved.

Peraeopods, uropods and telson as in *C. microphthalma*.

Remarks : The specimen closely agrees with the description and figures of *C. sardenta* given by Oliveira (1953), the differences being insignificant. The antennae are much longer, the flagella with more joints, otherwise similar. The inner plate of maxilla 2 is much narrower. 2nd palpar joint of maxilliped longer, twice as long as 1st. 6th joint of gnathopod 2 of male is broader, palm with a flat-topped tooth near the hinge of dactylus which is not found in Oliveira's specimen. This structure is, however, not of any systematic value (Schellenberg 1928 : 668). The present material is only half the length of the type which was 20·5 mm. in length.

I believe that *Grubia compta* Pearse (1912, p. 376, fig. 6, *not* Smith) from Florida should be referred to this species, though Barnard (1955)

unites it with *Cymadusa filosa*. Pearse's figures are strikingly similar to the present specimen, though the gnathopods are wrongly labelled.

Distribution : Rio de Janeiro, Brazil. This is the first record of this species from India.

Family Corophiidae

Genus *Corophium* Latreille

Corophium acherusicum Costa

(Fig. 14)

Corophium acherusicum Bate, 1862, p. 282 ; Della Valle, 1893, p. 364, pl. 1, fig. 11, pl. 8, figs. 17, 18, 20-41 ; Stebbing, 1906, p. 692 ; Chevreux & Fage, 1925, p. 368, fig. 376 ; Schellenberg, 1925, p. 191 ; 1928, p. 672 ; Shoemaker, 1934, p. 24 ; 1947, p. 53, figs. 2-3 ; 1949, p. 76 ; Crawford, 1937, p. 617, fig. 2 P. (literature) ; Barnard KH, 1940, p. 482 ; Reid, 1951, p. 269 ; Barnard JL, 1955, p. 37 ; Nayar, 1959, p. 43, pl. 15, figs. 14-20.

Material : Visakhapatnam harbour : 4 females from algae growing on wooden rafts.

Length : 2·7 mm.

Remarks : All the specimens studied are females. They have the characteristic features given by Crawford (1937). Antenna 1 : 1st joint of peduncle with 4 spines on the inner margin and 5 on the lower, the basal ones being slightly curved. Antenna 2 : 2nd joint of peduncle with 3 distal spines on the pointed lobe, 3rd joint with 2, 4th joint with 7 spines on lower margin arranged 2, 2, 2, 1 and 5th joint with 2 single spines equidistantly placed on lower margin. Gnathopod 1 : Side plate conically produced, with 3 long, apical setae. Dactylus with a tooth on the inner margin. Gnathopod 2 : Dactylus with one or two teeth on inner margin.

One specimen had the spines on antenna 2, joint 4, arranged as 1, 2, 2, 1 on the right and 1, 3, 2, 1 on the eft. Spines on joint 5 were arranged 2, 1 on both sides.

Distribution : Cosmopolitan in tropical and temperate seas. Previously recorded in India from the Krusadai Island in the Gulf of Mannar and presently from the Andhra coast.

Genus *Grandidierella* Coutiere

Grandidierella bonnieri Stebbing

Grandidierella bonnieri Stebbing, 1908, p. 120, pl. 6 ; Barnard KH, 1935, p. 299, figs. 12*d* & 13*b* ; 1951, p. 708 ; 1955, p. 7 ; Schellenberg, 1938(*b*), p. 215 ; Shoemaker, 1948, p. 11, fig. 3 ; Nayar, 1959, p. 38, pl. 14, figs. 1-5.

Grandidierella megnae Chilton, 1921, p. 548, fig. 10 ; Stephensen, 1933(*a*), p. 434.

Unciolella lunata Schellenberg, 1928, p. 669, fig. 207 (*not* Chevreux).

Material : Tuticorin : Several specimens from a saltwater pond in Hare Island. Devipattinam : 2 males and 2 females from algae on the sea shore. Tondi : Several specimens from a brackish water canal. Point Calimere : Several specimens from the Kodiakkarai swamp. Kovelong : Several specimens from the Buckingham Canal. Madras : Several specimens from the Adyar estuary and the Buckingham Canal. Ennore estuary : Several specimens from filamentous algae and oyster shells. Pulicat Lake : Several specimens from the lake, mud pools and salt pans.

Length : 8 mm.

Distribution : India, Philippines, Suez Canal, South Africa, Brazil, Bonaire Island, Caribbean sea, West Indies and Cuba.

Grandidierella gilesi Chilton

Grandidierella gilesi Chilton, 1921, p. 552, fig. 11 ; 1925, p. 537 ; Barnard KH, 1935, p. 300 ; Schellenberg, 1938(*a*), p. 93 ; Nayar, 1959, p. 40, pl. 14, fig. 6.

Material : Pinnakayal : 1 female and 2 males from the tanks of a saltwater pumping station. Tuticorin : 1 male and 1 female from a saltwater pond in the Hare Island.

Length : 7 mm.

Distribution : India, Tale Sap (Thailand) and Philippines.

Genus *Ericthonius* Milne-Edwards

Ericthonius brasiliensis (Dana)

Pyctilus brasiliensis Dana, 1853-55, p. 976, pl. 67, figs. 5 *a-h*.

Ericthonius brasiliensis Stebbing, 1906, p. 671 ; 1910, p. 463 ; Walker, 1909, p. 343 ; Kunkel, 1910, p. 100, fig. 39 ; 1918, p. 163, fig. 49 ; Chilton, 1923, p. 242, figs. 1-5 ; Chevreux & Fage, 1925, p. 353, fig. 360 ; Schellenberg, 1925, p. 187 ; 1926(*b*), p. 384 ; 1928, p. 668 ; 1931, p. 257 ; 1935, p. 233 ; 1938(*a*), p. 90 ; 1938(*b*), p. 217 ; Stephensen, 1927, p. 136 ; 1942, p. 402 ; Barnard KH, 1937, p. 173 ; 1955, p. 8 ; Shoemaker, 1935, p. 249 ; 1941, p. 188 ; 1942, p. 48 ;

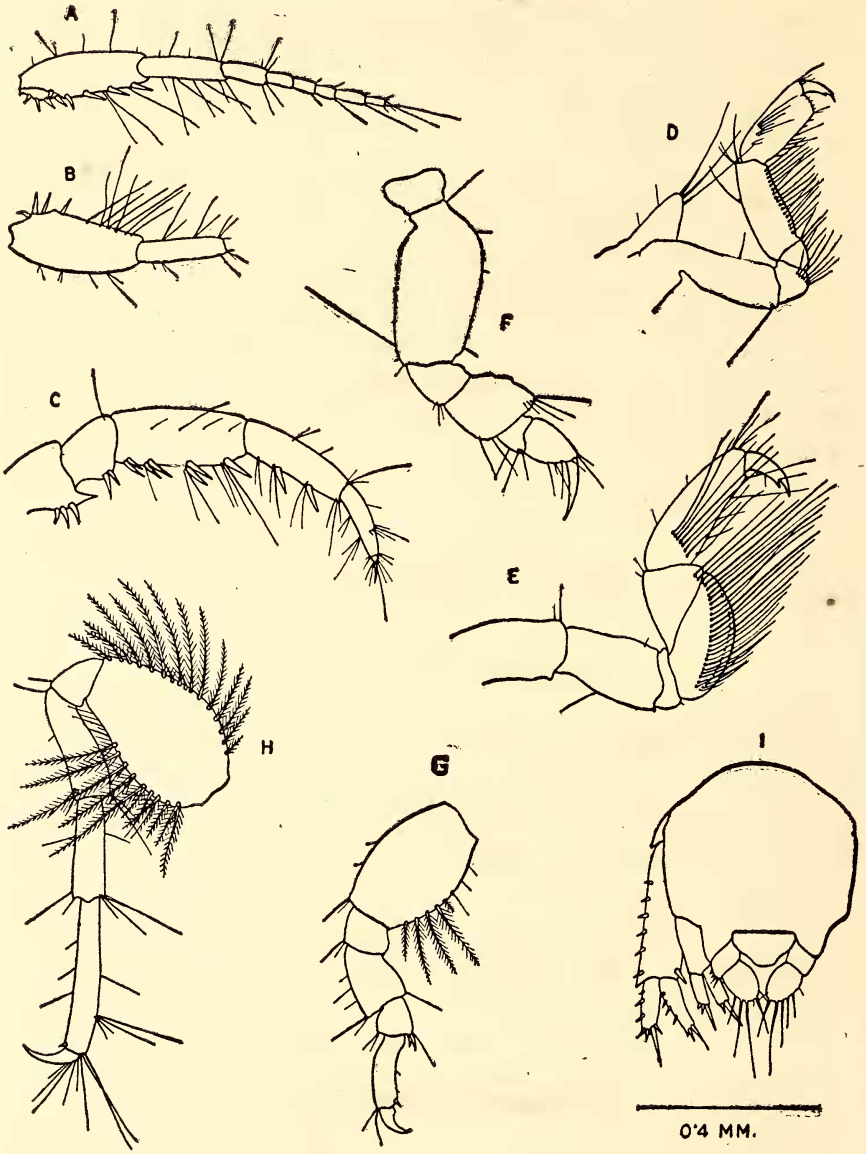

Fig. 14. *Corophium acherusicum* Costa. *Female*: A, antenna 1, side view; B, antenna 1, dorsal view; C, antenna 2; D, gnathopod 1; E, gnathopod 2; F, peraeopod 1; G, peraeopod 4; H, peraeopod 5; I, urus.

Rudwick, 1951, p. 153 ; Reid, 1951, p. 267 ; Barnard JL, 1955, p. 37 ; 1959, p. 39 ; Pillai, 1957, p. 60, figs. 14 (3-7) ; Nayar, 1959, p. 42, pl. 15, figs. 1-13.

Ericthonius brasiliensis Sexton, 1911, p. 218 ; Chevreux, 1911, p. 262 ; 1925, p. 391 ; Chevreux & Fage, 1925, p. 353, fig. 360 ; Pirlot, 1939, p. 68, 77.

Cerapus brasiliensis Bate, 1862, p. 267, pl. 45, fig. 8.

Ericthonius disjunctus Stout, 1913, p. 658.

Material : Pamban : 1 female from seaweeds. Kovelong : 2 females and 3 males from sponges. Madras harbour : Several specimens from ascidians.

Length : 4 mm.

Distribution : Cosmopolitan in tropical and temperate waters.

Family PODOCERIDAE

Genus *Podocerus* Leach

Podocerus brasiliensis (Dana)

Platophium brasiliense Dana, 1853-55, p. 838, pl. 55, fig. 9.

Podocerus brasiliensis Stebbing, 1917, p. 447 ; Barnard KH, 1925, p. 366 ; 1935, p. 305 ; Schellenberg, 1928, p. 674 ; 1938 (*a*), p. 94 ; 1938 (*b*), p. 217 ; Rudwick, 1951, p. 153, fig. 3 ; Barnard JL, 1953, p. 87 ; 1955, p. 39 ; 1959, p. 39 ; Nayar, 1959, p. 45, pl. 15, figs. 21-26.

Podocerus brasiliensis Della Valle, 1893, p. 329 ; Stebbing, 1906, p. 704 ; Reid, 1951, p. 267.

Cyrtophium brasiliense Bate, 1862, p. 274, pl. 46, fig. 6.

Platophium synaptochir Walker, 1904, p. 296, pl. 8, fig. 52.

Podocerus synaptochir Stebbing, 1906, p. 741 ; Walker, 1909, p. 343 ; Barnard KH, 1916, p. 279.

Material : Pamban : 1 male and 1 female from seaweeds. Madras harbour : Several specimens from ascidians, sponges and polyzoans on the concrete blocks.

Length : 4 mm.

Distribution : Cosmopolitan in the tropical and temperate seas.

Genus *Laetmatophilus* Bruzelius

Laetmatophilus sp.

(Fig. 15)

Material : Kovelong : 1 female from the washings of ascidians.

Length : 2 mm.

Description : Female : Head about twice as long as 1st segment. Eyes protruberant, rounded and dark. Body depressed and broad, the

short and narrow pleon being folded beneath. Body segments transversely grooved, not markedly keeled. Side plates small.

Antennae long, subpediform and densely setose. Antenna 1 : A little shorter than antenna 2 ; 1st joint of peduncle short and stout, front margin distally ending in a tooth. 2nd joint longer than the 3rd. Flagellum as long as 3rd joint, with 3 joints of which 1st is twice as long as the 2nd, 3rd very short. Antenna 2 robust, 2/3 as long as body. 2nd and 3rd joints of peduncle short, 5th longer than 4th. Flagellum with 2

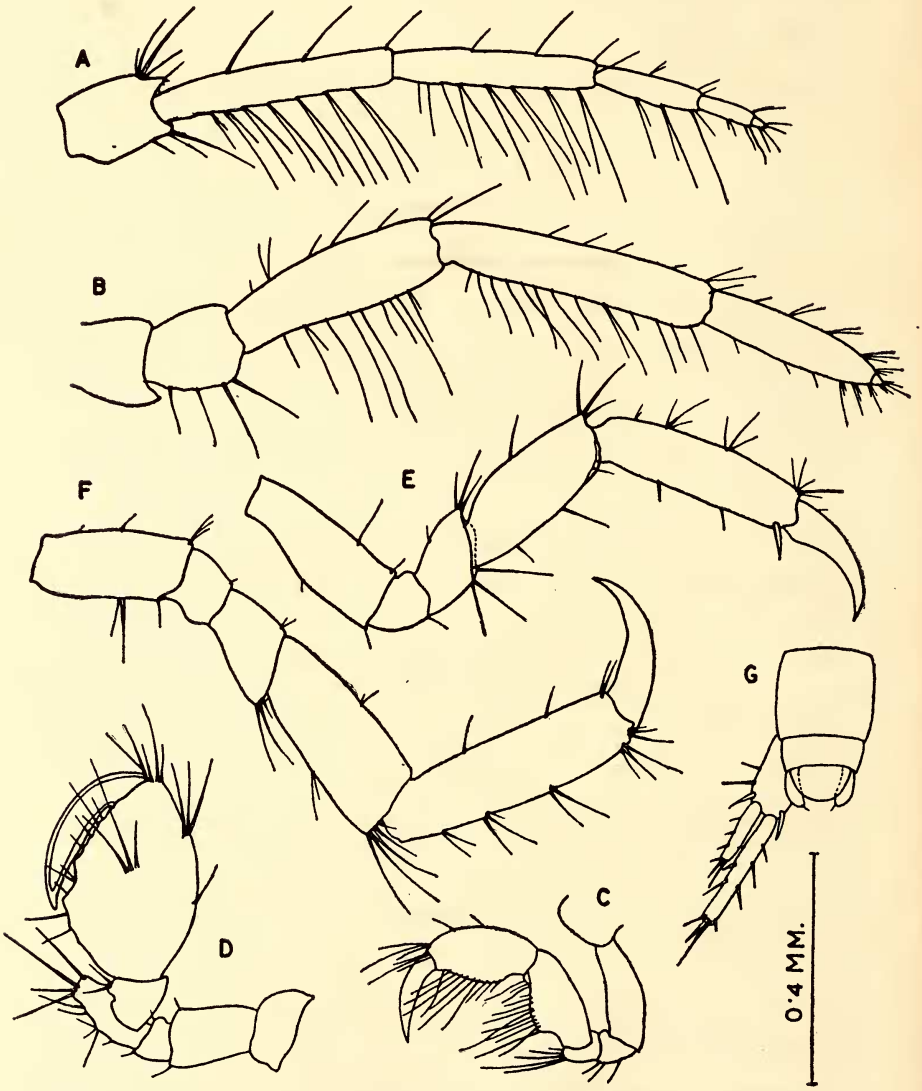

Fig. 15. *Laetmatophilus* sp. *Female :* A, antenna 1 ; B, antenna 2 ; C, gnathopod 1 ; D, gnathopod 2 ; E, peraeopod 1 ; F, peraeopod 5 ; G, urus.

joints, 1st joint 2/3 as long as 5th joint of peduncle, 2nd very short. Mouth parts typical of the genus.

Gnathopod 1 : Side plate very narrow. 5th joint as long as 6th, hind margin produced into a setiferous lamellar lobe. 6th joint widest at the middle, palm undefined. Dactylus stout, with averted point. Gnathopod 2 much longer than the preceding, with stout setae. 4th joint distally produced into an acuminate projection. 6th joint large, oval. Palm oblique, about $1\frac{1}{2}$ times as long as hind margin, defined by a small dentiform projection, followed by a concave space and the rest tubercular. Dactylus stout, longer than palm.

Peraeopods similar in size and structure. 2nd joint shorter than 5th. Joints 5-7 well-developed. Peraeopods 2-4 missing. Pleopods feebly developed. Uropod 1 well-developed and spinous. Outer ramus subequal to peduncle, half as long as inner ramus. Uropod 2 rudimentary, represented by a curved lobe with a short apical seta. Uropod 3 wanting. Telson semi-circular in shape.

Remarks : From a single female it is difficult to fix the identity of this specimen. Of the 7 species of *Laetmatophilus* so far described, the female is not known of *L. tridens* and *L. leptocheir* and among others the present specimen is very near to *L. purus* Stebbing.

Suborder CAPRELLIDEA

Family CAPRELLIDAE

Genus *Paradeutella* Mayer

Paradeutella bidentata Mayer

(Fig. 16)

Paradeutella bidentata Mayer, 1890, p. 29, pl. 1, figs. 35-36; pl. 3, figs. 36-41 ; pl. 5, figs. 34-35 ; pl. 6, figs. 12-25 ; 1903, p. 145 ; 1904, p. 225 ; Raj, 1927, p. 125, pl. 15, figs. 2 a-b.

Material : Pamban : 3 females from seaweeds growing on rocks under the railway bridge.

Length : 4·5 mm.

Remarks : This species seems to be very localised as all the previous records, as well as the present one, refer to material collected from the Gulf of Mannar.

Distribution : Ceylonese and Indian coasts of the Gulf of Mannar.

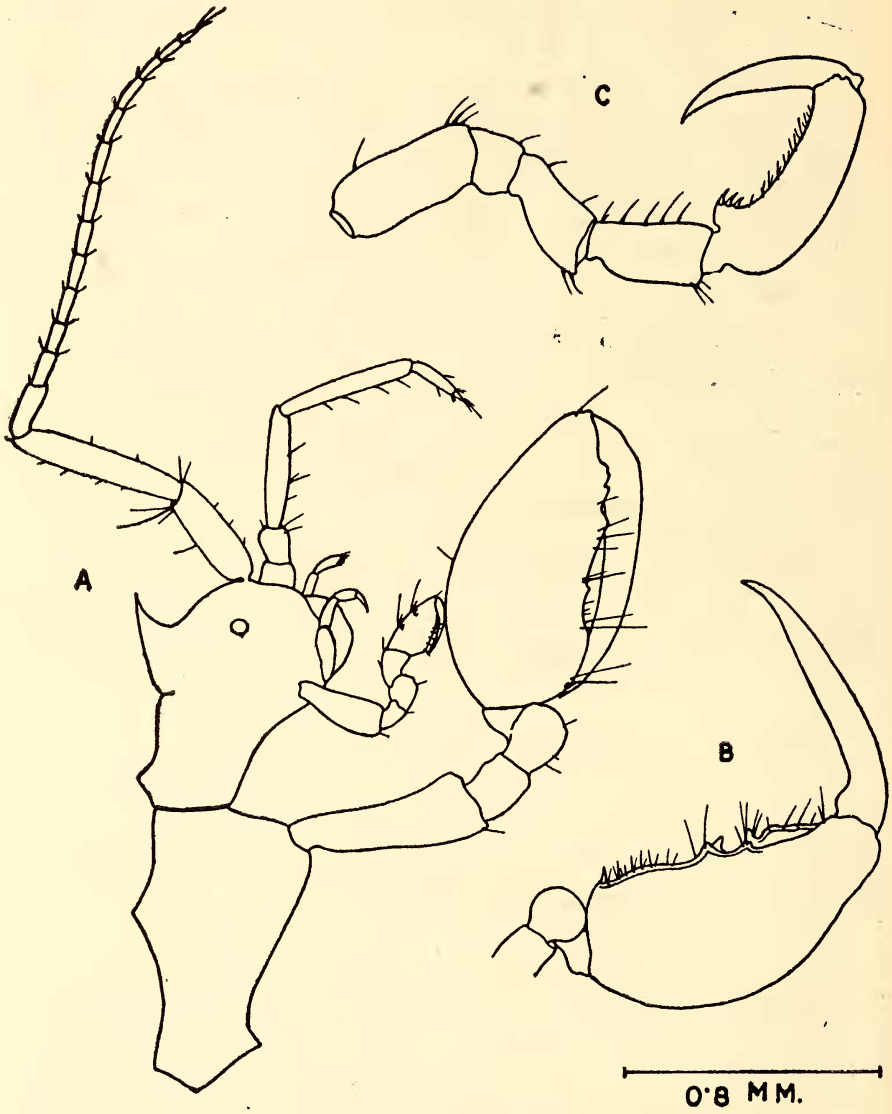

Fig. 16. *Paradeutella bidentata* Mayer. *Female* : A, front part of animal; B, gnathopod 2; C, peraeopod 5.

Genus *Tritella* Mayer

Tritella pilimana Mayer

(Fig. 17)

Tritella pilimana Mayer, 1890, p. 31, pl. 1, fig. 37, pl. 3, figs. 48-50, pl. 5; fig. 50, pl. 6, fig. 9 & pl. 7, fig. 7; 1903, p. 48, pl. 2, fig. 6.

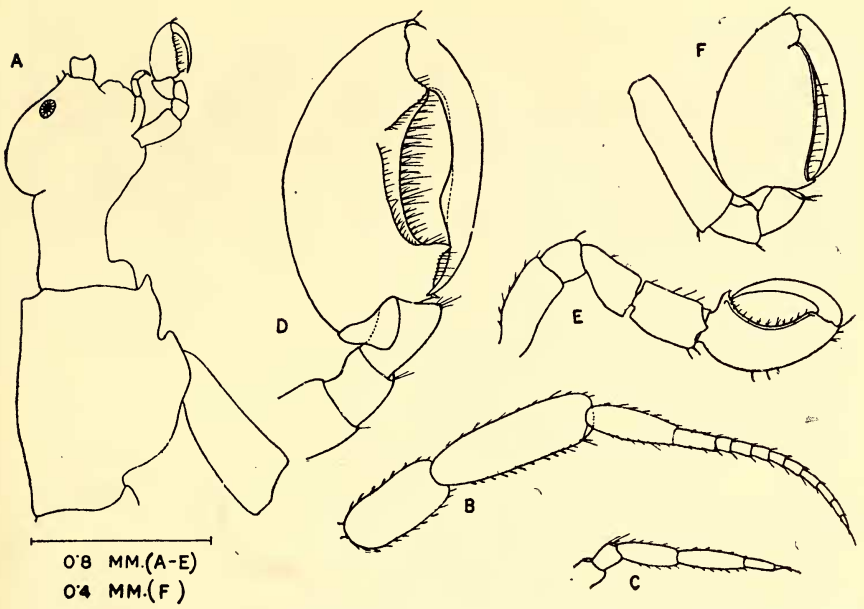

Fig. 17. *Tritella pilimana* Mayer. *Male :* A, front part of animal ; B, antenna 1 ; C, antenna 2 ; D, gnathopod 2 ; E, peraeopod 5. *Female* : F, gnathopod 2.

Material : Kovelong : 34 specimens from the hydroids and polyzoans growing on ascidians. Madras harbour : 3 females from polyzoans growing on concrete blocks.

Length : 6 mm.

Remarks : These specimens closely agree with Mayer's (1890, 1903) figures of this species first described from California. I am, however, doubtful of the identification, considering how these slow-moving animals could be distributed over such a long distance existing between California and India.

Distribution : California. This is the first record of this species from India.

Genus *Paracaprella* Mayer

Paracaprella alata Mayer

(Fig. 18)

Paracaprella alata Mayer, 1903, p. 67, pl. 2, figs. 40-41 & pl. 9, fig. 73.

Material : Madras : 28 specimens from polyzoans growing on sponges washed ashore at Marina beach.

Length : 4·2 mm.

Remarks : The specimens closely agree with the figures and description of this species given by Mayer (1903). I was not able to examine the mouth parts as the specimens were collected in a semi-dried condition. The specimens are also similar to Giles' (1888) *Caprella madrasana*, but his figures are not good. Mayer did not refer to this paper and it is possible that *P. alata* may have to be united with this species.

Distribution : Sydney, Australia. This is the first record of this species from India.

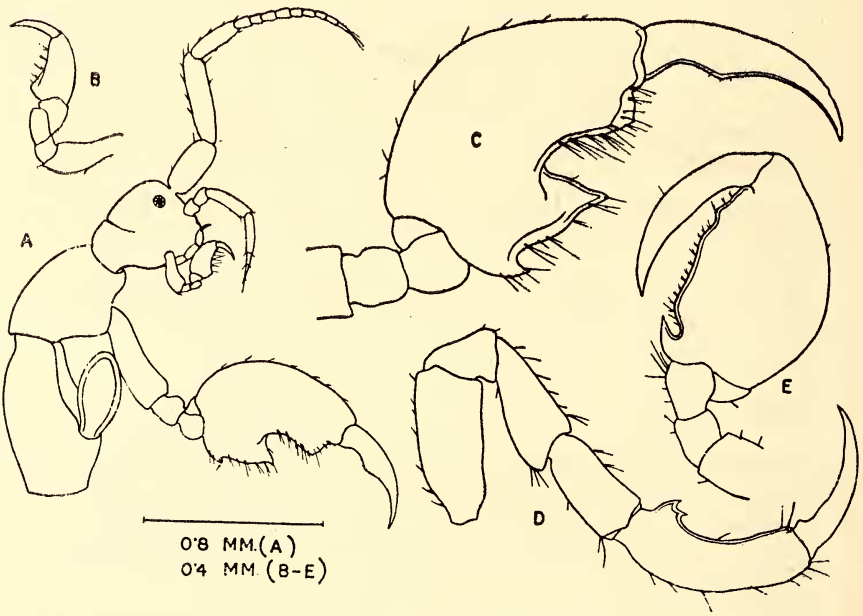

Fig. 18. *Paracaprella alata* Mayer. *Male* : A, front part of animal ; B, gnathopod 1 ; C, gnathopod 2 ; D, peraeopod 5. *Female* : E, gnathopod 2.

Notes on Ecology

The amphipods studied here are mostly littoral, collected from intertidal and shallow waters. Some are estuarine, brackishwater and terrestrial, collected from the sea-shore, estuaries and nearby ponds and canals. The littoral species were found clinging to seaweeds, free or attached to the rocks or washed ashore. Some species were also found in association with other invertebrates. *Orchomenella affinis* was collected from the washings of nudibranchs. *Ampelisca zamboange* was

found in the cavities of sponges. *Amphilochus schubarti* was found in the debris formed on compound ascidians. *Leucothoe spinicarpa* lives among algae as well as sponges and holothurians. *Maera quadrimana* was also found on holothurians. *Elasmopus pectenicrus* was found among zoantharian colonies and also among the arms of crinoids. *Lembos kergueleni* and *Cymadusa microphthalma* were found in the cavities of sponges. *Ericthonius brasiliensis* and *Podocerus brasiliensis* were collected from the washings of both sponges and ascidians. The caprellids were found clinging to polyzoan and hydroids growing on sponges and compound ascidians. The association of these amphipods with other invertebrates appears to be purely a chance occurrence and has not developed to the extent of commensal or semiparasitic relationship as they were also collected from seaweeds and the present observations do not indicate such a relationship.

Among the terrestrial amphipods, some talitrid and hyalid amphipods were collected from the sea-shore and on the banks of brackish-water and freshwater canals and ponds, two or three miles away from the sea-shore. Hurley (1959) applied the term 'supralittoral' to the amphipods of the sea-shore zone generally called sandhoppers. These are still dependent on sea-water for their distribution though their feeding and breeding may be performed on land. The term 'terrestrial' was used for those which are entirely independent of sea-water. In the sense of these terms, there are only supralittoral amphipods and no terrestrial ones in the present collection. *Orchestia anomala* was collected from under stones at the high tide mark, around saltwater ponds and also around a freshwater pond about a mile away from the sea-shore. *Talorchestia martensii* was collected from the tidal edge, the sea-shore and the banks of brackishwater and freshwater ponds and canals. *Parhyale inyacka* was collected from the intertidal waters as well as from under stones and jumping about at the tidal edge.

The change from marine to terrestrial environment is one of the important steps in the evolution of the Amphipoda. Carter (1931) says that the majority of terrestrial animals have reached the land by way of freshwater rather than directly from the sea. Pearse (1929) and Edney (1954) believe that the route to land was across the littoral zone rather than by way of estuaries and swamps. I think that both these routes are possible, though there are no truly terrestrial species in the present collection to prove this. *T. martensii* appears to have taken to land through the estuaries, though they are not still independent of water. It occurs in all the zones from the littoral area to the freshwater. *O. anomala* on the contrary, appears to have taken up land life through the sea-shore. It occurs under the stones on the sea-shore and also around freshwater ponds near the sea-shore.

Geographical Distribution

The interpretation of distributional data is an extremely complicated affair. The importance of a group of animals for zoogeographical conclusions depends on the volume of our knowledge of the group, the facilities for their dispersal and the barriers in their way of dispersal (Mahendra 1939). It is also necessary to consider the distribution of as many groups as possible before arriving at conclusions (Nicholls 1933). Our knowledge on the Amphipoda is far from complete. In this paper, distributional data are given for each species based on published information which are not necessarily complete.

The number of amphipod species known from India is not large and a large part of the Indian coasts remains to be explored for their amphipod fauna. Moreover, our knowledge of this group of animals from the rest of the Indo-Pacific area is rather meagre. These animals are also likely to be introduced from one country to another by ships whose bottom with their algal growth is an ideal habitat for them. In view of these points, no definite zoogeographical conclusions can be reached from the present study. However, the amphipod fauna of India has its closest affinity to that of Ceylon and other islands and countries bordering the Indian Ocean. In the present collection of amphipods, there are 9 cosmopolitan species. Apart from these there are 12 species which are nearly cosmopolitan (or are irregularly distributed and hence not of any importance in the present discussion). This is largely due to lack of knowledge of this group in several areas. 18 species are distributed in the Indo-Pacific Ocean. The maximum number of 19 species are restricted to the Indian Ocean. 3 species are known only from India, namely, *Paracalliope indica*, *Parhyalella indica* and *Photis digitata*, but it cannot be said whether they are truly endemic since our knowledge of this group of animals in the rest of the Indo-Pacific area is, as already pointed out, rather scanty.

Summary

The present paper is the second and concluding part of a systematic study of the Amphipod Crustacea of the east coast of India. A total number of 32 species belonging to seven gammaridean families and a caprellidean family are dealt with here, of which 16 species are recorded for the first time from India. The ecology of these amphipods is discussed. A discussion on the geographical distribution shows their close affinity to the Amphipoda of the islands and countries bordering the Indian Ocean.

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